PCT/EP2004 / 012489

EP04/12489

14 DEC. 2004

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05NOV03 E849455-1 D02029
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1. Your reference — RFW/ND/CB60576P

2. Patent application number
(The Patent Office will fill this part in) — 04 NOV 2003 — 0325735.9

3. Full name, address and postcode of the or of each applicant *(underline all surnames)*

GLAXO GROUP LIMITED
GLAXO WELLCOME HOUSE
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GREENFORD
MIDDLESEX, UB6 ONN
GB

Patents ADP number *(if you know it)* 00473587003

If the applicant is a corporate body, give the country/state of its incorporation — GB

4. Title of the invention

Toothbrush

5. Name of your agent *(if you have one)*

Corporate Intellectual Property

"Address for service" in the United Kingdom to which all correspondence should be sent *(including the postcode)*

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Country	Priority application number *(if you know it)*	Date of filing *(day / month / year)*

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8. Is a Patents Form 7/77 (Statement of inventorship and of right to grant of a patent) required in support of this request?

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Continuation sheets of this form	
Description	12
Claim(s)	3
Abstract	
Drawing(s)	3 only

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Priority documents	
Translations of priority documents	
Statement of inventorship and right to grant of a patent (Patents Form 7/77)	/
Request for a preliminary examination and search (Patents Form 9/77)	1
Request for a substantive examination (Patents Form 10/77)	
Any other documents (please specify)	

11. I/We request the grant of a patent on the basis of this application.

Signature(s) R. F. Walker Date 4 November 2003

12. Name, daytime telephone number and e-mail address, if any, of person to contact in the United Kingdom

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Toothbrush.

This invention relates to toothbrushes, in particular to electrically powered toothbrushes.

Electrically powered toothbrushes are well known articles. They generally comprise a head which supports a bristle carrier from which bristles (the term "bristle" as used herein encompasses other dental cleaning elements such as plastics material or elastomeric flaps, strips, fingers or lamellae) extend in a bristle direction, the head being connected to (or connectable to in a replaceable head toothbrush) a grip handle. The bristle carrier is moveable to move the bristles in a tooth-cleaning effect, e.g. in a rotary, oscillatory rotary, reciprocal, vibratory, combinations thereof or other direction, and can be driven in this movement by a small electric motor. The motor is generally located in the grip handle and connected to the bristle carrier by a suitable gearbox, transmission or drive train, but electric toothbrushes are known in which the motor is located in the head or in a neck between the head and handle. Motors are well known which can produce rotary, oscillatory rotary, reciprocal, vibratory, combinations thereof or other types of motion.

Such a motor needs an electric power supply and this is normally also located in the handle. Additionally the handle normally includes suitable controls such as an on-off switch, speed control etc. At present there are two main types of power supply. One type is one or more replaceable battery which can be replaced within the handle, typically one or two AA or AAA cells. An example of such a toothbrush is the AQUAFRESH™/POWERCLEAN™ toothbrush. Such replaceable batteries may be non-rechargeable or re-chargeable. Some users of electric toothbrushes dislike the cost and inconvenience of replacing batteries. Moreover commonly used AA cells are quite heavy and bulky, thereby restricting the compactness of a handle containing AA cells.

A second type of power supply is one or more rechargeable battery within the handle which can be recharged by docking the toothbrush with a charging station which is connected with the electric mains. An example of such a toothbrush is the Dr BEST™/BRILLANT toothbrush.

It is also known to use a capacitor as an electric power supply for such a motor. DE –A-195 13 539 discloses a capacitor-powered toothbrush that comprises a charging station with inductive (non-contact) charging of a capacitor. The charging station is powered from the mains supply. JP-A-8088942 discloses a circuit of the same architecture as DE –A-195 13 539 with a mains powered charging station base unit and inductive charging. JP-A-2000245072 discloses a mains powered charging station base unit that appears to charge a capacitor in the charging station. The electrical energy is transferred from the capacitor in the charging station to another capacitor in the handle via electrical contacts, until the voltages on the capacitors are equal.

Toothbrush users normally clean their teeth in the bathroom (the term "bathroom" herein refers to any room where the user normally performs toothbrushing, regardless of whether it includes a bath), and there is a prejudice against using devices in the bathroom which need to be connected to the mains. Moreover many bathrooms are not provided with suitable mains sockets.

It is an object of this invention to provide an electric toothbrush with an improved electric power supply, providing inter alia greater convenience, and improved compactness and weight. Other advantages will be apparent from the following description.

Accordingly this invention provides:

an electrically powered toothbrush comprising a head which supports a bristle carrier, the head being connected to or connectable to a grip handle, the bristle carrier being moveable by an electric motor in the toothbrush to provide a cleaning effect, and incorporating an electric power supply which comprises a capacitor capable of containing sufficient electric charge to drive the motor for a tooth cleaning session,

in combination with a charging unit which incorporates an electricity supply comprising one or more replaceable or rechargeable battery cell, and having an electrical connection means connectable to a corresponding connection on the toothbrush to enable electrical connection between the capacitor and the charging station, and with which the toothbrush may be connected.

The invention is based on the finding that one or more modern commercially available capacitor can contain sufficient electric charge to drive the types of electric motor commonly used in electric toothbrushes for a useful period, and can directly replace one, two or more AA or AAA size batteries for this purpose, and in particular that such capacitor(s) can rapidly be charged with sufficient electrical power for a toothbrushing session by connection with one or more replaceable or rechargeable battery cell, e.g. one, two or more AA or AAA size batteries in the charging station, without the need to connect the charging station to the electricity mains during the charging of the capacitor(s).

Generally the capacitor needs to provide electric power sufficient to drive the motor for at least 1 minute, preferably 2 minutes or more, for example up to 3 minutes or more, i.e. in line with dentists' recommendations for tooth brushing session times for adequate dental hygiene. Typically the rotary electric motors commonly used in electric toothbrushes have an 0.3W drive shaft power rating, with an estimated efficiency of 50%. Consequently the capacitor should be capable of delivering 0.6W electric power for this time period. Typically such motors can operate on a voltage supply of 1.5 – 3 volts, i.e. the typical output voltage of one or two (parallel or series connected) AA or AAA batteries, and the capacitor should be capable of delivering such an output voltage. It is found that a capacitor with a capacity of 15 - 50 Farad, preferably 16 – 22 Farad is capable of meeting these requirements, typically having a working output voltage of 1-5 - 3V, typically 2.5 +/- 0.25V.

Such capacitors are known, sometimes being termed in the art "Supercapacitors", "Ultracapacitors" or "Electrochemical double layer capacitors (EDLC)". They have ca. 2000x the volumetric capacitance of standard aluminium electrolytic capacitors. They combine the high energy density of batteries and the high power of capacitors. Such capacitors use high surface area carbon for accumulation of charge as opposed to the low surface area foils used in electrolytic capacitors. Suppliers include Panasonic, Elna, Epcos and Cooper Technologies. For example Cooper Technologies' supercapacitors use aerogel carbon as the active material which offers high surface area and high electrical conductivity.

In addition to the ability to charge the capacitors from one or more batteries without a mains connection during the charging process, other benefits of use of such a capacitor for electric toothbrushes include the following.

They can be charged vary rapidly, e.g. in less than 1 minute, preferably less than 30 seconds, even less than 15 seconds, compared with the several minutes or hours required by ordinary rechargeable batteries. Typically supercapacitors can be charged for 1000+ charge cycles without detrimental effects or reduced life. Supercapacitors are also light weight (lighter than equivalent dry cells) and low volume. For example capacitors of various capacities have typical outside diameter and length dimensions as below:

Capacitance (F)	Dimensions (mm)
50	18 OD x 40 L
33	33 OD x 35 L
22	16 OD x 35 L

Supercapacitors have an extremely low internal resistance for high power, low loss charging and discharging.

Moreover capacitors are environmentally friendly, containing no undesirable materials such as cadmium or zinc etc.

A particular advantage of a capacitor is that it need not be made in the typical cylindrical shape of a dry cell. The capacitor normally needs to be in the form of a closed loop, but this need not be cylindrical and so can be e.g. elliptical or "U" shaped in section, or a shorter fatter cylinder than the typical dry cell, or a hollow shell e.g. a tube within which other components of the electric toothbrush may be enclosed. This means that the capacitor can be adapted to the shape of the toothbrush handle rather than dictating the shape of the toothbrush handle.

Yet another advantage of the use of a capacitor as a source of electric power is that the toothbrush can be arranged to automatically stop when a suitable use time has elapsed, i.e. when the electric charge has been used up. This can act as a signal to the user that a suitable brushing time has elapsed, and can avoid the accidental battery run-down that may occur with a normal electric toothbrush using a dry cell if it is left switched on. A typical toothbrush electric motor driven using a capacitor as above-described capacitors can for example run at a suitable brushing speed (as

common in the art) for ca. 2 minutes then start to slow down, with a noticeable change in motor noise.

The capacitor may comprise a single capacitor e.g. of the capacity mentioned above, or two or more capacitors in a series or parallel connection to provide the above-mentioned electrical charge storage capacity.

By using such a capacitor an electric toothbrush can be made which is capable of being charged with sufficient electrical power to operate for one or more toothbrushing sessions by means of connection to a charging station incorporating typically 1 – 4 dry cells.

The toothbrush may incorporate two or more capacitors as described above in a series or parallel connection to the motor.

Other rapid-charging electrical charge storage devices are also known which may be rapidly charged with sufficient electrical power for a toothbrushing session by connection with one or more replaceable or rechargeable battery cell.

Consequently in a further aspect this invention provides:

an electrically powered toothbrush comprising a head which supports a bristle carrier, the head being connected to or connectable to a grip handle, the bristle carrier being moveable by an electric motor in the toothbrush to provide a cleaning effect, and incorporating an electric power supply which comprises a n electric power supply which comprises a rechargeable electricity storage means capable of being charged with sufficient electric charge to drive the motor for one tooth cleaning session during a charging period of five minutes or less,

in combination with a charging unit which incorporates an electricity supply comprising one or more replaceable or rechargeable battery cell, and having an electrical connection means connectable to a corresponding connection on the toothbrush to enable electrical connection between the rechargeable electricity storage means and the charging station, and with which the toothbrush may be connected.

Such a rechargeable electricity storage means may be made small and light, enabling an electric toothbrush which is compact and which can be rapidly charged.

Preferably the rechargeable electricity storage means is capable of being charged with sufficient electric charge to drive the motor for one tooth cleaning.

session during a charging period of three minutes or less, more preferably two minutes or less, most preferably one minute or less.

It has been found that certain commercially available rechargeable batteries can be charged from one or more other battery cell during the above-mentioned charging period with sufficient electricity to run motors of the above-described types for the typical toothbrushing session times mentioned above, and can be used as the rechargeable electricity storage means. Such rechargeable batteries may be fast charged using a constant current / constant voltage characteristic. NiCd rechargeable batteries have the lowest internal resistance and can recharge at high current equivalent to 3x the cell capacity. Some charge times to re-charge a range of NiCd batteries for a single toothbrushing session are listed below:

Type	Size	Capacity (mAh)	No. of uses*	charge time for one use (sec)**
GP100AAS	AA	1000	60	22
GP50AAK	2/3AA	500	30	44
GP18AK	1/3AA	180	11	123
GP30AAAK	AAA	300	18	74

*Based on a single use of 0.6W for 2 minutes. **Assuming a constant 3C current charge from the discharged state. Partial/rapid charging may accelerate the "memory" effect.

Therefore the rechargeable electricity storage means may comprise one or more NiCd rechargeable battery cell. Two or more such battery may be connected in series or parallel. NiCd batteries have environmental disposal problems, hence capacitors are preferred to NiCd batteries.

The capacitor and rechargeable electricity storage means of the toothbrushes of this invention may be conveniently initially charged and subsequently re-charged by connection with the charging unit with which it may be connected.

The charging unit may incorporate 1 – 4 dry cells each of nominally 1.5V output, e.g. household batteries, such as AA or AAA batteries. Typically such a charging unit may comprise a holder incorporating one or more, typically three, such dry cells. The charge characteristics of a capacitor depends upon the source impedance of the supply, but typically a capacitor as described above may be

charged by connection to a voltage source of 3.6 V, i.e. 3 typical dry cells (i.e. nominally 4.5V) just prior to use. Such dry cells may themselves be replaceable but non-rechargeable, or may be rechargeable.

Replaceable alkaline disposable cells can re-charge a 22F capacitor in about 20 seconds.

The charging unit may incorporate one or more rechargeable battery. Rechargeable NiCd batteries are preferred in the charging station as they present the lowest source impedance, can be replaced or trickle charged from the mains supply, and can re-charge a 22F capacitor in about 10 seconds. Therefore the charging unit may incorporate one or more (typically three) such battery cell(s) and means to connect such battery(ies) to the electricity mains for charging in a generally known manner. Such a charging unit may for example have its battery(ies) charged by connection to a mains supply outside the bathroom, then be disconnected from the mains supply and transferred to the bathroom for use, to be re-charged when the charge in the battery(ies) is exhausted.

Suitably the toothbrush can be docked with the unit to achieve such a connection. Preferably the electrical connection means comprise low impedance contacts to deliver the high current charge pulse that occurs during the charging process, metal-to-metal contacts being suitable. For example the toothbrush may have electrical contacts on its outer surface which make contact with the connections when the toothbrush is docked with the unit. Preferably such electrical contacts on the toothbrush are shielded e.g. recessed to prevent accidental discharge of the charged capacitor. It is found that ca. 3 AA batteries are sufficient to repeatedly charge such a capacitor for a period of a month or more, even three months or more, when the electric toothbrush is used twice a day for typical toothbrushing sessions.

Such a charging unit, provided for a toothbrush as described above, comprises a further aspect of this invention.

The head, bristle carrier, overall construction of the handle, motor, controls e.g. on-off switch etc. of the toothbrush and its grip handle may be otherwise conventional.

Some suitable electric toothbrush motors are listed below:

Manufacturer	Motor	Size (mm)	Reduction Gear ratio	Speed (rpm)	Efficiency (%)
Johnson	Standard	20 x 32	1:1	3500	60
Mabuchi	FF-M20VA	10 x 16.7	3:1	3000	42
Mabuchi	RF-M20VA	10.1 x 27	4:1	3500	55
Sanyo	TG-1001	10 x 17	3:1	3500	50
Sanyo	TG-1201	12 x 16	3:1	3500	60
Sanyo	10L-M-03-150	10 x 25	4:1	3500	53
Namiki	SLC10-1806	10 x 18.1	2:1	3500	50

Typically a rotary or oscillatory rotary motion toothbrush head experiences a load of 200-700 g during use, and it is found that the rotary motors listed may be driven using the capacitor electric power supply or rechargeable electricity storage means of the invention, the Sanyo TG-1001 being a particularly low cost compact motor capable of powering a typical electric toothbrush drive train.

It has been found that the capacitor can be connected directly to the electric motor in a simple replacement for the one or more AA or AAA battery with which the electric toothbrush is normally provided for use. However for some applications it may be advantageous to use known power management circuitry, e.g. on a "chip" to control the power flow from the capacitor to the motor, e.g. a voltage regulator or current limiter to maintain constant speed as the capacitor discharges. Suitable circuitry is apparent to those skilled in the art, or for example as disclosed in DE - A-195 13 539, JP-A-8088942 and JP-A-2000245072 above-mentioned. However it has been found that the toothbrush can function effectively without such circuitry when capacitors of the above-described type are used, e.g. with the capacitor connected directly to the motor with optionally only an on-off switch or circuit breaker between the capacitor and the motor.

Using capacitors of the above described types the toothbrush may be recharged from ca. three replaceable or rechargeable (e.g. NiCd) dry cells in ca. 10-20 seconds with sufficient electrical power for at least one toothbrushing session, in some cases e.g. with optimised efficient motors, drive train etc, for two or more toothbrushing sessions.

It is also believed to be novel *per se* to use certain of the above-described capacitors as an electric power supply for an electrically powered toothbrush.

Therefore in a further aspect this invention provides an electrically powered toothbrush comprising a head which supports a bristle carrier, the head being connected to or connectable to a grip handle, the bristle carrier being moveable by an electric motor in the toothbrush to provide a cleaning effect, and incorporating an electric power supply which comprises a capacitor with a capacity of 15 - 50 Farad capable of containing sufficient electric charge to drive the motor for a tooth cleaning session.

Preferably the capacitor has a capacity of 16 – 22 Farad. Typically the capacitor has a working output voltage of 1-5 - 3V, typically 2.5 +/- 0.25V. The toothbrush may incorporate two or more capacitors in a series or parallel connection to the motor to provide the mentioned electrical storage capacity.

The invention will now be described by way of example only with reference to the accompanying drawings.

Figs. 1 and 2 show discharge characteristics for two capacitors.

Fig. 3 shows schematically an electric toothbrush of this invention.

Referring to Fig. 1 the discharge characteristics of a 22F capacitor, viz. a Cooper PowerStor 22F/3.6V at fixed power (constant 0.7Wload), voltage, current and power over time being shown. This capacitor had a size 16mm OD x 35mm long.

Referring to Fig. 2 the discharge characteristics of a 15F capacitor, viz. a Cooper PowerStor 15F/3.6V at fixed power (constant 0.7Wload), voltage, current and power over time being shown. This capacitor had a size 16mm OD x 25mm long, i.e. 60% of the length of an AA cell.

In both cases the capacitors were initially charged to 3.6V. A known voltage regulation circuit was used, and 85% efficiency was assumed.

In both Fig. 1 and Fig. 2 it is seen that constant power is delivered over a period of at least 100 seconds, corresponding to a typical toothbrushing session.

In an experiment a typical commercially available Dr BEST (GlaxoSmithKline Consumer Healthcare GmbH & Co. KG) electric toothbrush was taken. This is normally powered by two series connected AA batteries, e.g.

"Energizer"™ batteries. These powered a rotary motor which in turn drove an oscillatory rotary bristle carrier in the head. Without any other modification the two batteries were removed and replaced by a Cooper PowerStor Aerogel 33F/3.6V capacitor, with the connections of the capacitor connected to the contacts of the battery compartment of the toothbrush.

With the toothbrush switched off the connections of the capacitor were connected for a period of 20 seconds to three AA batteries arranged in series (i.e. nominally ca. 4.5V output). The AA batteries were disconnected from the capacitor and the toothbrush was switched on.

It was found that the toothbrush as powered by the charged up capacitor ran at a comparable speed and delivered comparable torque to the speed and torque formerly achieved when it was powered by the two series connected AA batteries with which it had originally been supplied, for a period of at least two minutes.

Referring to Fig. 3 a typical construction of the electric toothbrush 10 and a recharging unit 20 is shown.

The electric toothbrush 10 is based upon a typical off the shelf replaceable battery-powered toothbrush such as the AQUAFRESH POWERCLEAN. Toothbrush 10 comprises a head 11 which supports a bristle carrier 12 mounted for oscillatory rotary motion in a known manner. The head is integrally formed into tubular neck 13 which is replaceably connectable at end 14 to the grip handle 15. The neck 13 encloses a drive shaft 16. When the neck 13 is connected to handle 15 the drive shaft 16 connects with the output shaft 17 of rotary motor 18, being a typical 0.6W output motor driven by a 3 volt electricity supply, so that the motor 18 can directly drive the shaft 16. In place of the two AA replaceable batteries with which the toothbrush is normally powered there is a PowerStor 33F capacitor 19, which is found to fit easily into the battery compartment in the handle 15. The connections 110 of the capacitor 19 were connected to the positive and negative terminal connections (not shown)of the battery compartment and consequently to motor 18 via the on-off switch 111. The connections 110 are also parallel connected by connectors 112 to metal re-charging contacts of a jack socket 113 fixed in the end of handle 15.

To charge the capacitor 19, with the on-off switch 110 in the "off" configuration to disconnect motor 18 from capacitor 19 the handle 15 is docked with the charging unit 20. Unit 20 comprises a plastics material enclosure 21, which has a cavity 22 to receive the end of the handle 15. Within cavity 22 is situated a corresponding jack plug 23 which when the handle 15 is received in cavity 22 make electrical contact with the contacts of socket 113. Other types of connector may be used to connect the connections 110 of capacitor 19 to the charging unit 20, e.g. metal contacts in the sides of the handle 15.

Unit 20 encloses three serially connected AA batteries 24 e.g. "Duracel" AA cells which are serially connected to the contacts of jack plug 23. Enclosure 21 can be opened to install and replace batteries 24.

When the handle 15 is docked in this way the capacitor receives sufficient charge in ca. 20 seconds via the connection of plug 23 and socket 113 to run the motor 18 for at least 2 minutes. After the capacitor 19 is charged the handle is removed from cavity 22 and the on-off switch 110 may be operated to connect the motor 18 to capacitor 19 to drive the bristle carrier 12 so that the toothbrush 10 can be used. After use the on-off switch 111 is returned to the off setting (alternatively automatic means may be provided to switch the motor off after a suitable time period or when the output of electric power from capacitor 19 drops below a pre-set level), and the toothbrush 10 is returned to the unit 20 so that the plug 113 and socket 112 connect and the capacitor is re-charged for next use.

The unit 20 may also include auxiliary electrical features 25 such as a battery 24 level indicator, or an indicator to show that charging is complete. Alternatively the toothbrush 10 may incorporate such features (not shown).

In an alternative construction the three battery cells 24 may be replaced by three or a different number of rechargeable battery cells such as NiCd battery cells, and the unit 20 may then also incorporate a charging system (not shown) of generally known type to enable the unit to be connected to the electricity mains supply via a suitable transformer (not shown) and suitable conventional circuitry (not shown) to thereby charge rechargeable batteries 24. In such a construction the rechargeable batteries 24 may be charged at a convenient mains socket outside of the bathroom, and when charged (e.g. as indicated by an indicator 25) the unit 20 may

be disconnected from the mains and the unit 20 returned to the bathroom. In this state the unit 20 presents no dangers to a user should it accidentally become wet or fall into water in the bath.

In an alternative construction the on-off switch 110 may be omitted and respective electrical contacts, e.g. the socket 113 and plug 23 respectively in the handle 15 and unit 20 may be kept apart, e.g. by a spring bias when the handle is docked in cavity 22. With the handle 15 in cavity 22 the handle 15 may be moved e.g. against the spring bias to bring the contacts together. This causes the batteries 24 to charge the capacitor 19, but simultaneously the capacitor 19 starts supplying electrical power to the motor 18 which starts running. However the capacitor 19 charges up at such a fast rate relative to the power drain through motor 18 that charging of the capacitor 19 still takes place in seconds, e.g. less than 30 seconds. The toothbrush 10 can then be un-docked from unit 20 and used, and the motor 18 stops automatically when the charge in capacitor 19 has been drained by motor 18 to a level insufficient to run motor 18. The head 11 of toothbrush 10 may then be washed under a tap and returned to unit 20.

Claims.

1. An electrically powered toothbrush comprising a head which supports a bristle carrier, the head being connected to or connectable to a grip handle, the bristle carrier being moveable by an electric motor in the toothbrush to provide a cleaning effect, and incorporating an electric power supply which comprises a capacitor capable of containing sufficient electric charge to drive the motor for a tooth cleaning session,

in combination with a charging unit which incorporates an electricity supply comprising one or more replaceable or rechargeable battery cell, and having an electrical connection means connectable to a corresponding connection on the toothbrush to enable electrical connection between the capacitor and the charging station, and with which the toothbrush may be connected.

2. A combination according to claim 1 wherein the capacitor provide electric power sufficient to drive the motor for a tooth cleaning session of two minutes or more.

3. A combination according to claim 1 or 2 wherein the capacitor is capable of delivering 0.6W electric power for the tooth cleaning session.

4. A combination according to claim 1, 2 or 3 wherein the capacitor has a capacity of 15 - 50 Farad.

5. A combination according to claim 4 wherein the capacitor has a capacity of 16 – 22 Farad.

6. A combination according to claim 3, 4 or 5 wherein the capacitor has a working output voltage of 1-5 - 3V.

7. A combination according to any one of claims 1 to 6 wherein the capacitor is an electrochemical double layer capacitor.

8. A combination according to any one of the preceding claims wherein the toothbrush incorporates an electric power supply which comprises a single capacitor.

9. An electrically powered toothbrush comprising a head which supports a bristle carrier, the head being connected to or connectable to a grip handle, the bristle carrier being moveable by an electric motor in the toothbrush to provide a cleaning effect, and incorporating an electric power supply which comprises a n electric power supply which comprises a rechargeable electricity storage means capable of being charged with sufficient electric charge to drive the motor for one tooth cleaning session during a charging period of five minutes or less,

in combination with a charging unit which incorporates an electricity supply comprising one or more replaceable or rechargeable battery cell, and having an electrical connection means connectable to a corresponding connection on the toothbrush to enable electrical connection between the rechargeable electricity storage means and the charging station, and with which the toothbrush may be connected.

10. A combination according to claim 9 wherein the rechargeable electricity storage means comprises one or more NiCd rechargeable battery cell.

11. A combination according to any one of claims 1 to 10 wherein the charging unit incorporates 1 – 4 dry cells.

12. A combination according to claim 11 wherein the dry cell(s) is/are one or more AA or AAA batteries.

13. A combination according to any one of claims 1 to 10 wherein the charging unit incorporates one or more rechargeable battery.

14. A combination according to claim 13 wherein the one or more rechargeable battery comprises a NiCd battery.

15. A combination according to any one of the preceding claims wherein the electrical connection means comprise low impedance contacts

16. A charging unit for a combination as claimed in any one of the preceding claims.

17. An electrically powered toothbrush comprising a head which supports a bristle carrier, the head being connected to or connectable to a grip handle, the bristle carrier being moveable by an electric motor in the toothbrush to provide a cleaning effect, and incorporating an electric power supply which comprises a capacitor with a capacity of 15 - 50 Farad capable of containing sufficient electric charge to drive the motor for a tooth cleaning session.

18. A toothbrush according to claim 17 wherein the capacitor has a capacity of 16 – 22 Farad.

19. A toothbrush according to claim 17 or 18 wherein the capacitor has a working output voltage of 1-5 - 3V.

22F capacitor

(16mm OD x 35mm)

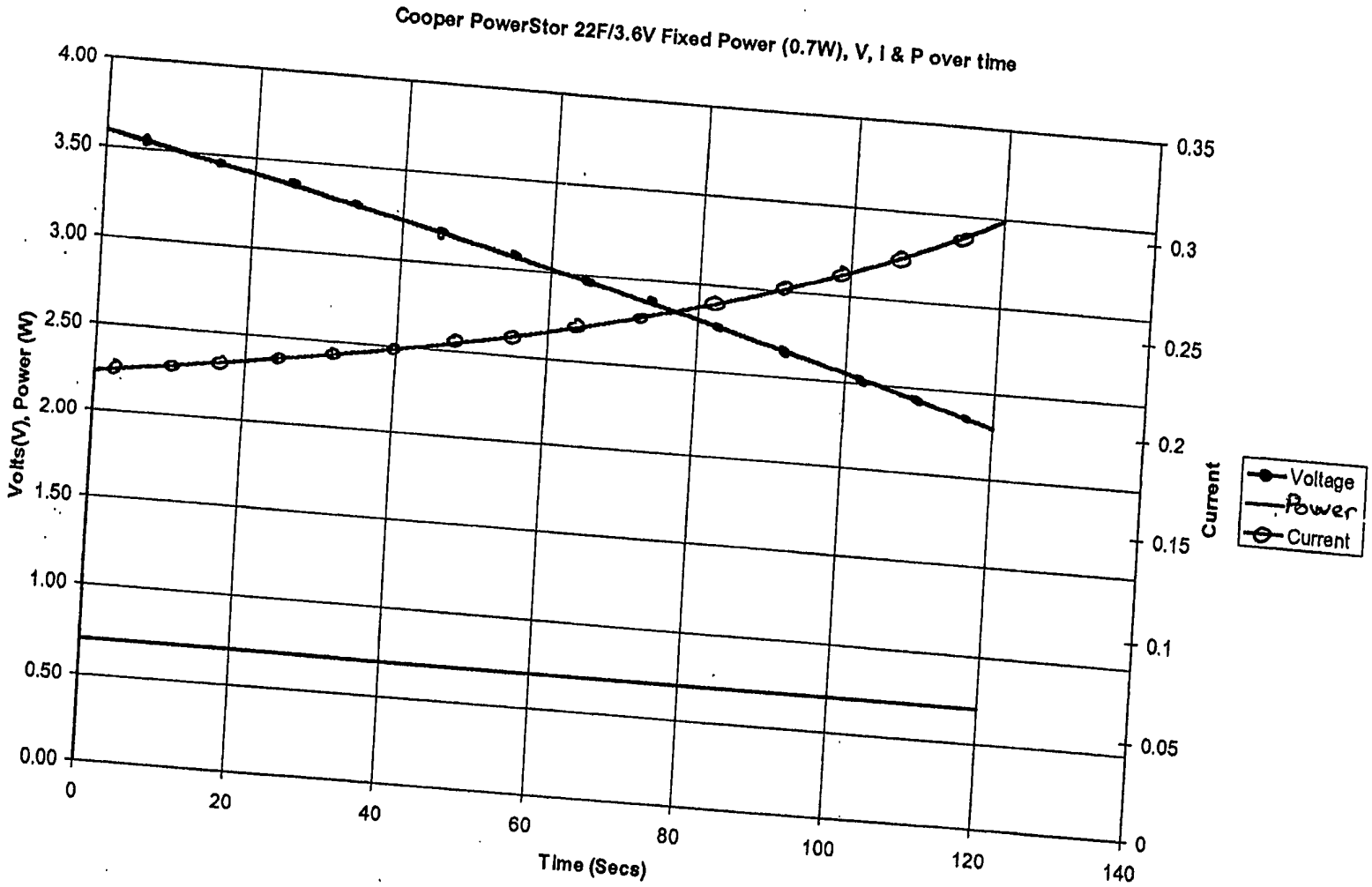

Fig. 1

15F capacitor

(16mm OD x 25mm, or 60% length of AA cell)

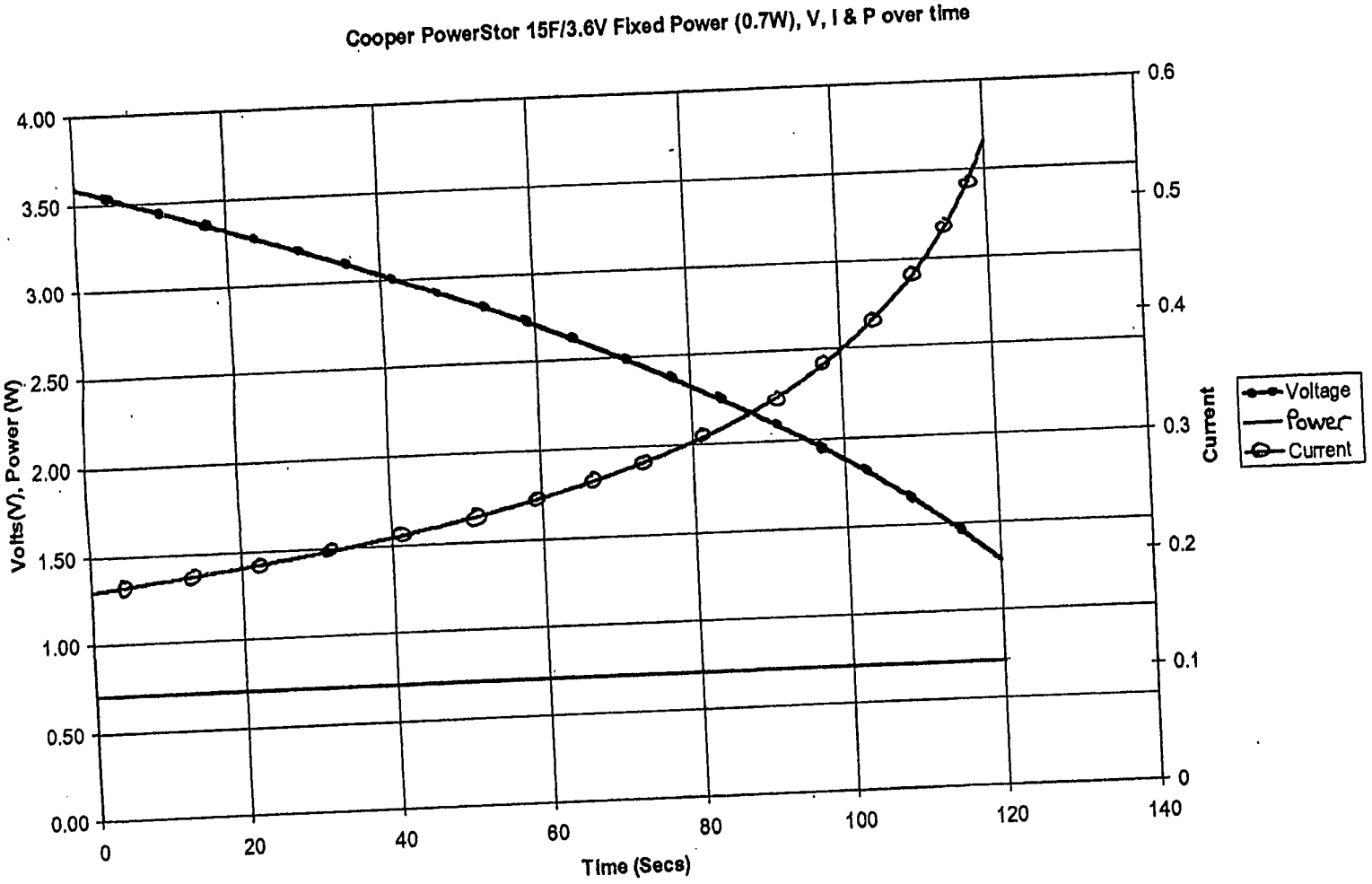

Fig 9

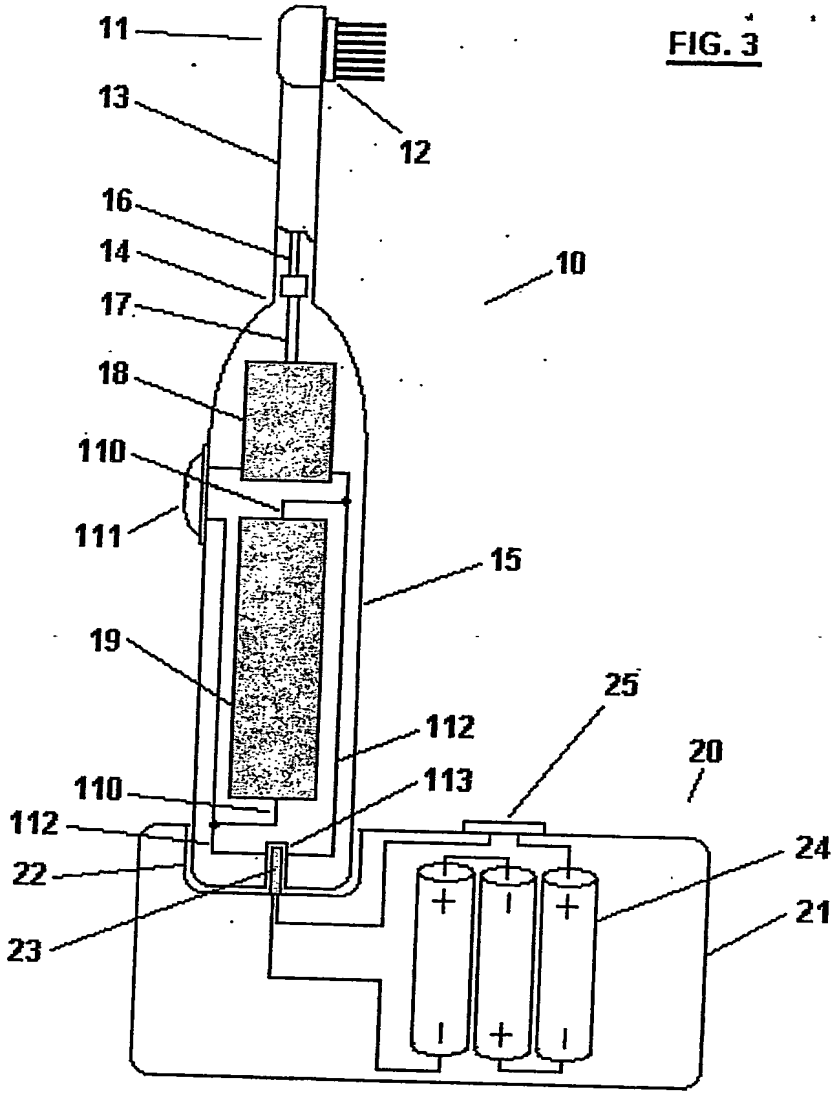
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FIG. 3